DOCUMENT RESUME

ED 195 346 PS 011 856

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TITLE A Comparative Study of the Impact of Day Care Experiences on Mathematics Performance of Selected Students.
PUB DATE Nov 80
NOTE 10p.: Paper presented at the Annual Meeting of the Mid-South Educational Research Association (9th, New Orleans, LA, November 13, 1980).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Academic Achievement: Comparative Analysis: *Day Care: *Early Experience: *Elementary School Students: *Mathematics Instruction: *Program Effectiveness
IDENTIFIERS California Achievement Tests: Mathematics Achievement

ABSTRACT

This study compares the mathematics performance of pupils who received no day care experiences with those who received mathematics instruction in a structured day care setting, and those exposed to incidentical learning in day care centers. Eighty-six first, second, third, and fourth grade students who had completed four years in a Title I program were studied. Twenty of these students had no formal day care experiences prior to first grade while 33 were exposed to incidental learning and 33 were exposed to a structured program. Subjects' scores on the California Achievement Test (CAT) were analyzed and a comparison of scores among the three groups was made. Results (See Table II) indicate that at the end of each grade, the group which had participated in a structured mathematics program in day care achieved significantly higher grade placement than either the incidental learning group or the group with no day care experience. In addition, at the end of each grade, the incidental group achieved a significantly higher grade placement score than the group with no day care experiences. (Author/MP)

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A COMPARATIVE STUDY OF THE IMPACT OF DAY CARE EXPERIENCES ON MATHEMATICS PERFORMANCE OF SELECTED STUDENTS

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PS011856

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Paper presented at the Ninth Annual Meeting of the Mid-South Educational Research Association in New Orleans, Louisiana on November 13, 1980

INTRODUCTION

Little has been done with studies of day care children's mathematics concepts and their acquisition. However, mathematics is an area where children are not performing as well as they have in the past. Smith (1978) stated that there is a need for day care experiences which extends a young child's mathematical thinking.

Rea and Reys (1975) have noted the lack of research on matical abilities of day care students. Teachers of young children who turn to the literature of research for a description of the mathematics abilities of the children find little information for planning instruction. Research in this area is sparce in quantity, narrow in scope, and largely dated by having been carried out prior to the many developments which have greatly expanded the experiences of today's young children.

It has been noted by educators that low income children have the tendency to lag further behind in school each year. With preschool intervention programs aimed at changing this pattern, an evaluation of the effectiveness of such programs has been conducted by members of a consortium for longitudinal studies headed by Irving Lazar (1978).

Schewinhart and Weikart (1978) found that treatment and control children scored similarly in the first grade but with each succeeding year the treatment children pulled ahead until by eighth grade they scored significantly higher than control children in mathematics (Weikart, 1978). In another report, treatment children scored better than control children on reading and arithmetic tests in the fifth grade (Palmer, 1978).

The treatment-control differences are not only statistically significant but are also of practical importance. Beller's project, a structured program, provides a good example since it fell right in the middle of the six projects in terms of effectiveness. In Beller's project the difference between treatment and control children on mathematics achievement (controlling for age, sex, and pretest IQ score) was .52 grade equivalent. That is, treatment children were fully a half grade ahead of the control children who had not attended preschool. This is an appreciable difference, especially considering that four or five years had elapsed since the preschool experience.

The Get Set Program of Philadelphia, a structured program, was evaluated by Prusso (1979). Findings with regard to the child development component showed that children's prekindergarten experiences in Get Set enhanced their achievement in mathematics.

Ann Lukasevich and Roland F. Gray (1978) investigated the effects of open space, open education and pupil performance. They wanted to study the effects of instructional style and architectural design on pupil outcomes. Three hundred twenty-one third grade students from five open space schools and five traditionally built schools in the metropolitan area of Vancouver, Canada were selected for their study. School achievement was measured by four sub-tests of Form 2 of the Canadian Tests of Basic Skills (18). The four subscales include measures of vocabulary, reading comprehension and mathematics concepts. In each comparison, the difference favored the group in the nonopen program. For mathematics concepts, scores were highest when the pupils were taught in nonopen facilities with nonopen programs.

PURPOSE

The purpose of this study is to compare the mathematics performance of pupils who received no day care experiences with those who received

mathematics instruction in a structured day care setting, and those exposed to incidental learning in day care centers.

HYPOTHESIS TO BE TESTED

There is no significant difference in mathematics performance of first, second, third, and fourth grade students who had no day care experiences and those who received structured mathematics instruction or incidental mathematics exposure.

METHOD

Eighty-six children who had completed four years in a Title I program were selected. Twenty (20) of these children had no formal day care experiences prior to first grade while 33 were exposed to incidental learning and 33 exposed to a structured program. These subjects were selected from Title I participants to eliminate the socio-economic variable.

Data obtained from results of the California Achievement Test were analyzed for comparison of scores between three groups of students who:

1. Did not participate in day care.
2. Participated in a structured mathematics program in day care.
3. Participated in an incidental mathematics program in day care.

Information pertaining to the type of mathematics program in each center was obtained through interviews with teachers in the various centers.

RESULTS

A one way analysis of variance was run to ascertain if differences existed between the three groups in mathematics achievement at the end of the first, second, third, and fourth years.

This analysis revealed an F value large enough to reject at the .001 level at the end of each grade. (See Table I)

TABLE I

ANALYSIS OF VARIANCE OF MATHEMATICS ACHIEVEMENT (GRADE LEVEL) SCORES FOR GROUPS WITH NO DAY CARE EXPERIENCE, WITH STRUCTURED DAY CARE EXPERIENCE, AND WITH INCIDENTAL LEARNING EXPERIENCE.

Grade Level	Mean Square Between (a)	Mean Square Within (b)	F	P
1	4.793	0.177	27.089	.001
2	7.057	0.202	34.890	.001
3	9.047	0.245	36.855	.001
4	20.184	0.376	53.711	.001

a. df = 2

b. df = 83

Since at least two groups differed significantly at each grade level, the Scheffe' Test for multiple comparison was run to determine which groups actually differed significantly. The results of these comparisons (See Table II) indicate that at the end of each grade, the group which had participated in a structured mathematics program in day care achieved significantly higher grade placement than both the incidental learning group or the group with no day care experience. In addition, at the end of each grade, the incidental group achieved a significantly higher grade placement score than the group with no day care experiences.

Therefore, the hypothesis to be tested is rejected.

TABLE II

SCHEFFE' TEST FOR MULTIPLE COMPARISONS BETWEEN THE GROUPS OF NO DAY CARE EXPERIENCE, INCIDENTAL LEARNING IN MATHEMATICS AND STRUCTURED MATH PROGRAMS AT THE FIRST, SECOND, THIRD, AND FOURTH GRADE LEVELS. THE MEAN SCORES ARE IN PARENTHESIS.

	COMPARISONS	F	P
Grade 1	Structured (1.76) and Incidental (1.18)	19.56	<.01
	Structured (1.76) and No day care (.96)	56.34	<.01
	Incidental (1.18) and No day care (.96)	15.49	<.01
Grade 2	Structured (2.82) and Incidental (2.25)	26.92	<.01
	Structured (2.82) and No day care (1.76)	67.56	<.01
	Incidental (2.25) and No day care (1.76)	14.40	<.01
Grade 3	Structured (3.89) and Incidental (3.12)	39.79	<.01
	Structured (3.89) and No day care (2.76)	65.15	<.01
	Incidental (3.12) and No day care (2.76)	6.61	<.05
Grade 4	Structured (5.23) and Incidental (4.41)	35.65	<.01
	Structured (5.23) and No day care (3.44)	106.80	<.01
	Incidental (4.41) and No day care (3.44)	31.36	<.01

F' .05 (2,83) = 6.22

F' .01 (2,83) = 9.76

DISCUSSION

This study examined the achievement test scores for mathematics for first, second, third, and fourth grade students who received no day care experiences with those who received mathematics instruction in a structured program and those exposed to incidental learning in day care centers.

One of the most interesting aspects of this study was revealed when, at the end of each grade level, the mean grade placement of each group was compared to an expected grade placement, for the average child. This analysis revealed that for the structured group, (all children are

in a Title I program) the average for the group was below the expected grade placement (at the end of the first grade the "average" child would have a grade placement of 2.0). However, this difference decreases each year until at the end of the fourth grade the structured group was above the expected grade level. (See Table III)

TABLE III

MEAN GRADE PLACEMENT OF THE GROUPS WITH NO DAY CARE EXPERIENCE, STRUCTURED MATHEMATICS EXPERIENCE, AND INCIDENTAL LEARNING EXPERIENCES INCLUDING THE DEVIATION FROM AVERAGE GRADE PLACEMENT.*

	GRADE 1		GRADE 2		GRADE 3		GRADE 4	
GROUP	$\bar{X}$	D	$\bar{X}$	D	$\bar{X}$	D	$\bar{X}$	D
Structured N = 33	1.76	-.24	2.82	-.18	3.89	-.11	5.23	+.23
Incidental N = 33	1.18	-.82	2.25	-.75	3.12	-.88	4.41	-.59
No Day Care N = 20	.96	-1.04	1.78	-1.22	2.76	-1.24	3.44	-1.56

* These means reflect grade placement at the end of the respective grades. Tests were given in April each year.

D-Deviation from average grade placement.

The analysis for the incidental mathematics group revealed that the average for the group was below the expected grade placement at the end of each year. These differences were inconsistent. However, at the end of the fourth year the deviation from average grade placement was less than the deviation for the previous three years.

The analysis for the group with no day care experience revealed that the average for the group was below the expected grade placement at the end of each year. The uniqueness of this group was that they were far below grade level at the end of the first grade and this deviation increased consistently each year.

This study has provided strong evidence that day care centers can be beneficial to the academic growth of elementary school children in the area of mathematics. This suggests that teachers in day care centers teach mathematics skills that are retained even after the children leave the day care centers.

This study suggests that day care centers with a structured environment for mathematics are more beneficial than those where children are exposed to incidental learning. It would seem, therefore, that such programs merit serious consideration for the benefit of our children.

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